



Closeout Report

from the

DIRECTOR'S REVIEW

OF

**CDF RUN IIb
DETECTOR UPGRADE**

January 18-19, 2005

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Executive Summary

Technical:

A major element of the CDF Run IIb Detector Upgrade was finished with the installation of the Central Preshower and Crack Calorimeter during the FY04 Shutdown. Good progress has been and is being made on the other work to complete.

Cost:

The overall project is about 50% complete. A current estimate to complete (ETC) of \$3.7M was presented. This includes over \$300K of anticipated adjustments to the baseline. The Project Manager proposes a 32% contingency on the ETC. The new budget at completion (BAC) including contingency is \$8,418K. This is to be compared to the Major Item of Equipment (MIE) funding total of \$10,375K. The difference of \$1,957K may represent an amount of funding greater than needed.

Earned Value tracking and reporting is not required on this project. The project however does update the project status in the schedule and prepares a cost performance report (CPR) on a monthly basis.

A detailed "bottom up" estimate to complete was not prepared by the project team. The committee was unable to verify that the proposed ETC is exact. The committee did perform some spot checks of the ETC using an assembly of data available. We believe the ETC presented may be taken as a good indicator. Thus, the BAC including contingency should be adequate to complete the project.

Schedule:

The project identified items that need to be completed in time for installation in the Collision Hall during the FY05 Shutdown planned for the last eight weeks of the fiscal year. Barring unforeseen problems, these items should be completed in time for this installation. Several systems have boards that do not require extended access to the Collision Hall. They will likely be completed prior to the January 2006 formal Level 1 milestone date for Trigger and DAQ upgrades ready to install. The project is shooting to complete these by September 2005. The committee believes meeting the September 2005 date is at risk. In fact, the January 2006 date may not be met by all parts of all systems.

Management:

In the last review major improvements in Level 2 and 3 managements were identified. These improvements are paying off well. Some of the outstanding personnel needs from the prior review have been met. Other needs have been identified in the intervening period, but the management believes these needs can be met within the collaboration.

1.0 Introduction

A Director's Review of the Run IIb CDF Detector Upgrade Project was held on January 18-19, 2005. The areas assessed were Technical, Cost, Schedule and Management. The Review Committee's assessment of the project's progress, plans for completion and the cost estimate to complete the work is documented in the body of this report. Reference materials are contained in the Appendices. The Cost and Contingency estimate by the project is shown in Appendix A. The Charge for this review is shown in Appendix B. The review was conducted per the agenda shown in Appendix C. The members of the Review Committee and their assignments are listed in Appendix D and a list of Review Participants is given in Appendix E. Appendix F is a table that contains all the recommendations contained in the body of this report.

2.0 Calorimeter Commissioning & Operation Plans and Commission Plan for Balance of the Project

Calorimeter Commissioning

Findings

- WBS 1.2 covers the Calorimeter Upgrades and consists of two subprojects, 1.2.1 Central Preshower and Crack Detectors and 1.2.2 Electromagnetic timing. Both subprojects have completed construction and were installed during the recent 2004 shutdown.
- Both systems have been tested with cosmic rays and more recently with collision data. The EM timing is working as planned with ~ 1 nsec timing and with only 3 of ~ 1700 channels not functioning. The Preshower and Crack modules are also working as planned with reasonable occupancies and signals with expected pulse heights. The Preshower detector has 99.7% of its channels operational.
- Work continues on ~5 spare Preshower modules and associated photomultiplier boxes and optical cables. The Estimate to Complete is now only \$19K with the lion's share of this a known expense for cost overrun labor at Michigan State associated with these spares. The contingency on these projects has been set at \$20K.

Comments

- The Project Management and the collaborating institutions are to be congratulated for completing these two subprojects since the last review. The installation of the Preshower and Crack modules was tricky and was completed successfully and safely with the help of a large number of collaborators and several technician and engineering groups at Fermilab.
- The contingency estimate of \$20K was not well justified and seems high (105%) relative to the remaining invoices expected on the projects. However the amount is small.
- The old adage used to be that “the job is not finished until the paperwork is done”. Unfortunately we now live in an era where the job is not finished until someone drives a stake into it and prevents anyone from generating any more paperwork that has to be dealt with. The project management should consider setting a deadline for closing down these projects (say by May 1, in three months), make sure all invoices are in

hand before then, and then shut down the associated task codes. Any remaining contingency at that point should be formally returned to the laboratory. This could serve as a model for closing the rest of the subprojects.

Recommendations

None.

Operation Plans and Commission Plan for the Balance of the Project

Findings

- This is not a formal WBS element, but the end game of the project involves commissioning and operations of the various parts and such plans were presented.
- The TDC Project is best accomplished with installation of small batches of 30 – 60 boards in short ~1 shift accesses during the current collider running. The Project expects sufficient access opportunities before an August 2005 shutdown, but if this work cannot be fully accomplished by then they have a fallback option of replacing a priority batch of about 100 TDCs (about 1/3 of the total) during the shutdown. Commissioning is not a problem since all cards are fully checked out on test stands before installation so that this work is just like replacing a broken card during regular operations.
- The Level 2 project is expected to be installed by March 2005 and the system is parasitic so that commissioning can be done without downtime to the experiment.
- The Event Builder commissioning requires down time and is therefore scheduled for the shutdown. A full vertical slice of the system is planned for this summer before the shutdown and can be done parasitically.
- The Level 3 Computer upgrade is scheduled for the August 2005 shutdown so as to have no impact on operations.
- The SVT upgrade has new boards which will initially be tested in a test stand. It is hoped to then test each piece of this upgrade with real data prior to the August shutdown, but this project has “in kind” contributions that might miss the shutdown window. Since new crate(s) are required for this upgrade, it will be possible to do some vertical slice tests even

during collider running after the 2005 shutdown if required. Some real downtime to the experiment would occur for final commissioning, but in most scenarios only the SVT itself would be unavailable for operations. This could impact secondary vertex triggering in CDF for a period after the 2005 shutdown.

- The revised XFT project requires collision hall access for installation of optical fibers and some electronics boards. This XFT work drives the project's "ready for shutdown" date. The XFT installation is also coupled to the TDC work. Still, there is a good chance for the collision hall components to be ready by August, and the infrastructure work (including the optical fibers) can be done in advance. Eventual commissioning requires collisions, but this work can be done in parallel with data taking by the experiment.
- In all the subprojects, physicists are the primary source of effort for the commissioning and operations. Some effort from the Particle Physics Division support crew for CDF is required in several cases. A small amount of contract labor is required and effort on the TDC cards is expected from a separate PPD electronics fabrication group with checkout by the CD PREP enterprise.

Comments

- In most cases the installation, commissioning and operations impact for each of these subprojects seems well thought out and the Project has backup plans for various disaster scenarios. The required effort by physicists, engineers, and technicians has been identified and should be available since it is quite similar to (maybe even less than?) the effort required in the 2004 shutdown.
- The largest uncertainties are the rate of TDC installation and the arrival of all parts for the SVT installation. The recent glitch with one board in the XFT project may cause trouble, but it is too early to tell. The biggest impact on the experiment would be reduced operational efficiency during collider running for a short period following the August 2005 shutdown.
- The Project management clearly should continue to monitor progress in these critical areas and develop more detailed backup plans as required

Recommendations

1. The laboratory should understand the status of all the critical parts before starting the “August” 2005 shutdown. It may be that a short delay in this schedule would be obvious by June 2005.

3.0 Data Acquisition and Trigger Status and Scope

Schedule

Findings

- Project scheduled to end by September 30, 2005.
- L1 milestone three months later.
- No explicit schedule contingency in the quoted ready for shutdown date (currently July 28, 2005).
- Project does not perceive any large advantage to delayed start of shutdown (but see XFT).

Comments

None.

Recommendations

None.

Costs

Findings

- Estimated Cost to Completion determined from difference of baseline costs and ACWP\$.
- Contingency estimates are calculated as fractions of ETC.
- Contingencies do not include explicit additional considerations for recovering from schedule slippages.

Comments

- Delays engender costs. The contingency on XFT is prudent.

Recommendations

1. Consider basing contingency on work yet to be done, including possibility of extra manpower.

Installation

Findings

- No large demands for installation personnel.
- Much of the installation occurs as components become available.
- Collision hall access is required for
 - TDC modification installation and checkout.
 - XFT transition cards, XTC and cabling.
- Event Builder installation will cause a brief DAQ downtime
- SVT installation is a disruption

Comments

- Successful calorimeter upgrade completion and installation on tight schedule is an indication of the capabilities of this team.
- The development of parallel paths for commissioning is admirable.
- It is important that a detailed schedule be developed (as is happening) to minimize downtime as new components are brought on-line.

Recommendations

2. Maintain adequate communication with Laboratory on progress on these projects to set a sensible shutdown date.

WBS1.3.1: TDC Modifications

Findings

- Internal TDC Production Decision Review-Sept 28 2004.
- CDF terminated fabrication of Run IIb TDCs after successful fabrication and testing of prototypes because Run IIa TDCs were judged to be adequate and minimize potential risk of downtime due to commissioning effort.
- Rev D TDCs require modifications to implement fast clear capability to increase L2 accept rate.
- Project requires access to Collision Hall before shutdown. It intends to exploit opportunities (> few hours) to swap boards. If these are not available, may request eight hrs/month.
- Project depends upon availability of Fermilab and Michigan resources for board modifications.

Comments

- Project pursued plan to facilitate decision that was outlined during previous review.
- Not obvious that all TDC boards require modification.

Recommendations

3. Re-evaluate contingency as project gains experience.

WBS 1.3.2: Level 2 Trigger

Findings

- Internal Installation Readiness Review-Sept 27 2004.
- Almost all hardware already on hand.
- Commissioning is in progress.
- Expected to be fully operational in March.
- Plan is in place for short and long-term support.

Comments

- Parasitic testing and commissioning using copies of inputs is prudent and effective.

Recommendations

None.

WBS 1.3.4/1.3.5: L3 Farm and Event Builder

Findings

- Internal EB progress Review – Dec 17 2004.
- EB hardware acquisition nearly complete.

Comments

- 1 kHz readout should be achievable.
- A range of dates was given - the sooner (seems to be) the better.

Recommendations

4. Adopt Change Request for additional VRB crates and associated SCPUs.

WBS 1.3.6: Silicon Vertex Trigger

Findings

- Internal progress review –January 4, 2005.
- Yield of AM chips lower than anticipated.
- Change in Level 3 manager anticipated in February.

Comments

- Impressive amount of work achieved.
- Project manager reports that there is significant schedule risk associated with the software, firmware and AM.
- Schedule in mind of Level 2 manager and subproject seemed different.

Recommendations

5. Establish timetable for decision to acquire additional AM chips.
6. Monitor management transition period to reduce risk that something is missed during this crucial time.

WBS 1.3.11: XFT II

Findings

- This project was baselined in August 2004.
- Recent internal review (Dec 8 2004) emphasized need to complete firmware, generate detailed plan for board testing, and identify additional personnel for software and management of commissioning.

- SLAM and Finder were a month behind schedule before the latest news on the Finder prototype fabrication issue was reported.
- XTC, transition cards and optical fiber expected to be ready for shutdown by July 27, 2005.
- Huge amount of work done.

Comments

- Significant progress over the past six months.
- Final determination regarding latency is an open issue; this could impact schedule and is a substantial concern.
- What is plan for deciding on option to install two chips on SLAMs (60K\$ in chips plus design costs)?
- Status of Finder prototype boards highlights schedule concerns and has potential impact on plans for XTC transition card schedule.
- Minimal (if any) schedule contingency remaining.

Recommendations

7. Continue to push for slice test (currently expected in late spring).
8. Address recommendations of internal review committee. Consider all aspects of project.
9. The Laboratory should monitor progress as it may affect installation and shutdown timing.

4.0 Installation Plans for 2005

Findings

- Although the installation is “off-Project”, the committee heard fairly detailed installation plans for each element of the upgrade project.
- The installation plans were fully integrated with the construction plans down to Level 3 and were discussed both in the Level 2 and Level 3 presentations.
- A summary of upgrade installation plans was included in an overall summary of maintenance, repair, and installation plans for the August 8th accelerator shutdown.
- The planning and estimates are firmly grounded in the successful experience with the FY04 shutdown in which all scheduled work was completed.
- The project managers are well aware that not all installation work can be completed during the eight week shutdown and have developed staging plans which include:
 - Utilization of downtimes for partial installation
 - Schemes which allow commissioning of new electronics during operation

Comments

- The integration of installation and commissioning planning to Level 3 is commendable.
- The feeling of the committee is that the collaboration and the project managers have prepared a complete and robust installation plan which includes workable fallback positions for most potential problems.

Recommendations

None.

5.0 Cost, Schedule and Management

Findings

- CDF project manager presented:
 - Estimate to Complete = \$3,724K
 - Estimate of Contingency needed = \$1,174K.
- The contingency represents 32% of the remaining cost.
- The available contingency = \$3,131K.
 - Agreed to DOE Funding = \$10,375K.
 - ACWP = \$3,520K.
 - ETC = \$3,724K.
- The Run IIb silicon project is complete (ETC = 0).
- The calorimeter upgrades are essentially complete.
- Remaining costs are for the DAQ and Trigger Project and for Administration.
- Schedule is driven by shutdown schedule:
 - Currently have a milestone for this at 28 July 2005.
- Level 1 milestone for Data Acquisition and Trigger Upgrades Ready to Install:
 - Forecast date is 22 Sep 2005.
 - Baseline date is 17 Jan 2006.

Comments

- CDF has a strong management team in place. Managers at all levels were well-informed about their projects and gave excellent status reports.
- The Estimate to Complete was examined by the committee in some detail. There are a couple of places where the Committee felt the Estimate to Complete might be slightly high:
 - Administration
 - Baseline = \$959K.
 - ACWP = \$430K.
 - ETC = \$529K.
 - Administration cost is mostly salaries, with some cost for travel and M&S added in; fairly flat in time.
 - The project is about 60% complete (in time).
 - At current rate of spending, ETC for administration would be about \$380K.
 - Project managers mentioned that they had used almost none of the budgeted travel cost.

- Event Builder
 - There were a few items here that were finished or nearly finished where actual cost was below the baseline cost.
 - Also, engineering for TDC readout will not be needed since the new TDCs will not be built.
- Contingency: The contingency of 30% for most projects was felt to be reasonable.
 - The contingency of 40% for XFT II is reasonable since this project has the largest estimate to complete and greatest uncertainty.
 - The contingency of 40% for the Run IIb TDC project could be reassessed after more boards have been modified.
- Overall, the Committee felt that CDF could complete the Run IIb projects with total funding = to their ACWP + ETC + contingency estimate (= \$8,418K).
- Schedule: The Committee believes that the September 22, 2005 completion date for the DAQ and Trigger upgrades may not be met for some items.
 - The news about the XFT Finder prototypes was very new, but some delay is inevitable.
 - Many of the electronics/trigger projects need not be complete in time for the 2005 shutdown.
- Even the January, 2006 date may not be met for some parts of some systems.
 - The project managers are doing a good job of planning the electronics installation and commissioning to minimize impact on data taking.

Recommendations

1. The committee encourages the management to monitor the costs closely and adjust the baseline cost when there are actual costs for complete tasks.
2. Management should ensure that additional costs due to schedule delays are adequately included in the contingency estimate.

Appendix A

WBS	Items	Project's Cost Estimate (Fully Loaded At Year) \$						% Contingency for Remaining Work	Total (BAC + Adjustment + Cont.)
		Baseline BAC \$ (w/o cont.)	Anticipated Adjustments	ACWP \$	ETC \$ (w/o cont.)	Contingency \$			
1.1	Run IIb Silicon Project	1673	-352	1321	0	0	0%	1321	
1.2	Calorimeter Upgrades								
1.2.1	Central Preshower and Crack Detectors	377	51	409	19	20	105%	448	
1.2.2	Electromagnetic timing	36	-13	23	0	0	0%	23	
1.3	Run IIb DAQ and Trigger Project								
1.3.1	Run IIb TDC Project	547	266	494	319	128	40%	941	
1.3.2	Run IIb Level 2 Project	437		347	90	50	56%	487	
1.3.4	Event-Builder Upgrade	518	96	114	500	150	30%	764	
1.3.5	Computer for Level 3 PC Farm / DAQ	479	173	210	442	133	30%	784	
1.3.6	SVT upgrade	281	81	0	362	109	30%	471	
1.3.11	Revised XFTII Project	1620	15	172	1463	585	40%	2220	
1.4	Administration								
1.4.3	Construction Phase	959		430	529		0%	959	
Project Totals		6,927	317	3,520	3,724	1174	32%	8418	

Comments

BAC values are baseline, from the December 2004 monthly report
 Anticipated Adjustments are current estimates of necessary changes to the baseline
 ACWP are from the Dec. report
 ETC is the difference, BAC - ACWP
 Contingency is estimated differently for each subproject

W.B.S.

1.1 This is now complete, so the contingency is 0
 The work is finished, but 20K seems appropriate for closeout miscellany.
 1.2.1
 1.2.2 This is now complete, so the contingency is 0
 1.3.1 This will be estimated at 40% of the remaining work
 1.3.2 \$50K assumed for miscellaneous
 1.3.4 This will be estimated at 30% of the remaining work
 1.3.5 This will be estimated at 30% of the remaining work
 1.3.6 This will be estimated at 30% of the remaining work
 1.3.11 This will be estimated at 40% of the remaining work

Appendix B

Charge for the January 18-19, 2005 Director's Review Of the CDF Run IIb Detector Upgrade

Please conduct a Director's Review of the CDF Run IIb Detector Upgrade project. Assessing progress to date by the Project Team is one of the charge items. CDF will present the progress on and status of the trigger upgrades. Assess the success of the installation and commissioning of the Central Preshower Detector Upgrade. Although installation of the upgrade is "off project," please examine the plans for the 2005 installation activities. Assess the schedule for completing the project relative to the formal CD-4 date, corresponding Level 1 Milestone date, as well as, the internal forecast date (November 2006, January 2006 and September 2005 respectively). Assess the commissioning plans for the Run IIb Detector Upgrade components. This assessment should include planned staffing needs and availability.

This review should cover the technical, cost, schedule and management aspects of the complete project. In particular, we would like a reassessment of the cost to complete and the associated contingency need.

Please present the Committee findings, comments, and recommendations in a closeout meeting with the CDF Run IIb Upgrade Project Team and Fermilab management and provide a written report within two weeks.

Appendix C

**Director's Review of the
CDF RUN IIb DETECTOR UPGRADE
JANUARY 18-19, 2005
RACETRACK (WH7X)**

AGENDA

<u>Tuesday,</u>	<u>January 18, 2005</u>	
12:30 pm-1:00 pm	Executive Session	E. Temple
1:00 pm-2:00 pm	Introduction and Summary (including resource requirements and availability to complete project and commission its components)	P. Lukens
2:00 pm-2:30 pm	Calorimeter Commissioning and Operations	J. Huston (video)
2:30 pm-2:45 pm	BREAK	
2:45 pm-3:15 pm	Data Acquisition and Trigger Status and Scope	P. Wilson
3:15 pm-5:00 pm	Trigger and DAQ Status and Plans	
	a. Event Builder	B. Knuteson (video)
	b. XFT (Track Trigger)	R. Hughes
	c. SVT (Silicon Vertex Trigger)	M. Shochet
	d. TDC Modification Plans	E. James
5:00 pm-5:30 pm	Installation, Maintenance and Shutdown Plans for 2005	R. Roser
5:30 pm	Executive Session	E. Temple
<u>Wednesday,</u>	<u>January 19, 2005</u>	
8:00 am- 9:00 am	Follow-up Discussions with CDF Team, as needed	
9:00 am-11:00 am	Write Report	
11:00 am-12:00 pm	Closeout Dry Run	
12:00 pm- 1:00 pm	LUNCH (continuing Dry Run as needed)	
2:00 pm	Closeout	

Appendix D

Report Outline and Reviewer Assignments for Director's Review of Run IIb CDF Detector Upgrade

Executive Summary	Ed Temple
1.0 Introduction	Dean Hoffer
2.0 Calorimeter Commissioning & Operation Plans and Commission Plan for Balance of the Project	John Cooper
3.0 Data Acquisition and Trigger Status and Scope	Stephen Pordes, George Ginther
4.0 Installation Plans for 2005	<u>Mike Crisler</u>
5.0 Cost, Schedule and Management	<u>Cathy Newman-Holmes,</u> Dean Hoffer

* Note underlined names are the primary writer.

PARTICIPANT CONTACT INFORMATION

John Cooper
Fermi National Accelerator Laboratory
M.S. 122
P.O. Box 500
Batavia, IL. 60510
630 840 2235
jcooper@fnal.gov

Mike Crisler
Fermi National Accelerator Laboratory
M.S. 208
P.O. Box 500
Batavia, IL. 60510
630-840-4099
mike@fnal.gov

George Ginther
Fermi National Accelerator Laboratory
M.S. 335
P.O. Box 500
Batavia, IL. 60510
630-840-2263
ginther@fnal.gov

Dean Hoffer
Fermi National Accelerator Laboratory
M.S. 200
P.O. Box 500
Batavia, IL. 60510
630-840-8898
dhoffer@fnal.gov

Cathy Newman-Holmes
Fermi National Accelerator Laboratory
M.S. 367
P.O. B ox 500
Batavia, IL. 60510
630-840-3336
cath@fnal.gov

Stephen Pordes
Fermi National Accelerator Laboratory
M.S. 308
P.O. Box 500
Batavia, IL. 60510
630-840-3603
Stephen@fnal.gov

Ed Temple
Fermi National Accelerator Laboratory
M.S. 200
P.O. Box 500
Batavia, IL. 60510
etemple@fnal.gov

Appendix E

Director's Review of the CDF Run IIb Detector Upgrade January 18-19, 2005

Participants

Review Committee

J. Cooper
M. Crisler
G. Ginther
D. Hoffer
C. Newman-Holmes
S. Pordes
E. Temple (Chair)

Directorate

J. Appel
H. Montgomery
M. Witherell

Department of Energy

Joanna Livengood
Ron Lutha

CDF Presenters

R. Hughes
J. Huston (video)
E. James
B. Knuteson (video)
P. Lukens
R. Roser
M. Shochet
P. Wilson

CDF Collaboration

D. Benjamin
Y.K. Kim
D. Knapp
K. Lannon
K. Pitts
L. Ristori
T.J. Sarlina

Appendix F

**DIRECTOR'S REVIEW
OF
CDF RUN IIb DETECTOR UPGRADE
January 18-19, 2005**

TABLE OF RECOMMENDATIONS

NO.	RESPONSIBLE	RECOMMENDATION	STATUS	DATE
Section 2.0 - Calorimeter Commissioning & Operation Plans and Commission Plan for Balance of the Project				
2.1		The laboratory should understand the status of all the critical parts before starting the "August" 2005 shutdown. It may be that a short delay in this schedule would be obvious by June 2005.		
Section 3.0 - Data Acquisition and Trigger Status and Scope				
3.1		Consider basing contingency on work yet to be done, including possibility of extra manpower.		
3.2		Maintain adequate communication with Laboratory on progress of these projects to set a sensible shutdown date.		
Section 3.0 – TDC Modifications (WBS 1.3.1.)				
3.3		Re-evaluate contingency as project gains experience.		
Section 3.0 - L3 Farm and Event Builder (WBS 1.3.4/1.3.5)				
3.4		Adopt Change Request for additional VRB crates and associated SCPU's.		
Section 3.0 - Silicon Vertex Trigger (WBS 1.3.6)				
3.5		Establish timetable for decision to acquire additional AM chips.		
3.6		Monitor management transition period to reduce risk that something is missed during this crucial time.		
Section 3.0 - XFT II (WBS 1.3.11)				
3.7		Continue to push for slice test (currently expected in late spring).		
3.8		Address recommendations of internal review committee. Consider all aspects of project.		
3.9		The Laboratory should monitor progress as it may affect installation and shutdown timing.		

No.	RESPONSIBLE	RECOMMENDATION	STATUS	DATE
5. - Cost, Schedule and Management				
5.1		The committee encourages the management to monitor the costs closely and adjust the baseline cost when there are actual costs for complete tasks.		
5.2		Management should ensure that additional costs due to schedule delays are adequately included in the contingency estimate.		